PATENT ABSTRACTS OF JAPAN

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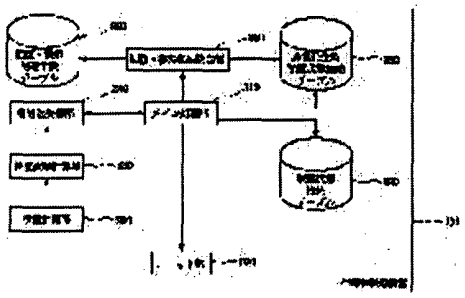
(54) SEMICONDUCTOR MANUFACTURING EQUIPMENT AND DEVICE MANUFACTURE

(57)Abstract:
PROBLEM TO BE SOLVED: To shorten a time until recovery and return of a device from abnormal stoppage thereof, by providing a state acquisition means for acquiring information regarding a processing stage and a state of each part of a device in a device when a device stops in emergency.
SOLUTION: When a device stops abnormally, a main processing part 310 acquires a device state from a device state storage table 390 and the state is stored in an emergency device state storage table 380. A signal expressing that the device is in stoppage is transmitted to a signal transmission part 340 and the device is in its stoppage state. When a signal expressing recovery from emergency from a position change sensor is received, a recovery processing decision part 350 decides recovery processing based on data of a recovery processing means table 360 and transmits it to the main processing part 310, and the main processing part 310 transmits an order of recovery processing to each unit part 370. Thereafter, when recovery processing is finished normally, return processing to a device state in emergency is carried out. After normal return is recognized, operation of a device is started again from a state immediately before stoppage thereof.



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CLAIMS

[Claim(s)]
[Claim 1] Semiconductor fabrication machines and equipment characterized by providing the following. A state acquisition means to acquire the information about the processing stage in the equipment at the time of a halt, and the state of each part of equipment when equipment stops by generating of an emergency. A detection means to detect that the aforementioned emergency was completed. A recovery means to send predetermined instructions to each part of equipment according to the processing stage of the equipment at the time of the aforementioned halt, and to perform recovery. A return processing means to send instructions to each part of equipment after this recovery or in parallel to this recovery that each part of equipment should be returned to the state of each part of equipment at the time of the aforementioned halt.
[Claim 2] The aforementioned detection means is a semiconductor aligner according to claim 1 characterized by being what detects that the position change stopped when it has a means to detect the position of equipment and equipment stops by position change.
[Claim 3] The aforementioned return processing meanses are semiconductor fabrication machines and equipment according to claim 1 or 2 characterized by being what sends the instructions for the aforementioned return when the aforementioned recovery is completed normally.
[Claim 4] When equipment stops by generating of an emergency, the aforementioned state acquisition means From the device-status storing table on which the newest information about the processing stage in equipment and the state of each part of equipment which equipment has is stored It is what acquires the information about the processing stage in the equipment at the time of a halt, and the state of each part of equipment. the aforementioned recovery means Semiconductor fabrication machines and equipment given in any 1 term of the claims 1-3 characterized by being what has the recovery table which specified the required processing for the recovery to each part of equipment according to the processing stage in the equipment when suspending equipment by generating of an emergency.
[Claim 5] They are semiconductor fabrication machines and equipment given in any 1 term of the claims 1-4 characterized by having a means to perform the required display related unusually when abnormalities become clear in the aforementioned recovery.
[Claim 6] When equipment stops by generating of an emergency using one semiconductor fabrication machines and equipment of the claims 1-5 The information about the processing stage in the equipment at the time of a halt and the state of each part of equipment is acquired. Detect it, when an emergency is completed, and after that, according to the processing stage of the equipment at the time of the aforementioned halt, send predetermined instructions to each part of equipment, and recovery is performed. Moreover, the device manufacture method characterized by returning each part of equipment to the state of each part of equipment at the time of the aforementioned halt after this recovery or in parallel to this recovery, and continuing manufacture of a semiconductor device.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] When emergencies, such as a rapid position change by the earthquake etc., occurred and equipment stops this invention, When the state of the equipment at that time is acquired and it recovers from an emergency after that It is related with the device manufacture method using the semiconductor fabrication machines and equipment and this which do automatic maintenance work (restoration processing) based on the processing beforehand set up about each unit of equipment, and perform restart of equipment, and a report of a failure part according to the result.
[0002]
[Description of the Prior Art] When emergencies, such as a rapid position change by the earthquake etc., occurred and equipment was stopped conventionally, subsequent recovery and subsequent return processing were performed according to the manual with which the inspection person in charge was decided.
[0003]
[Problem(s) to be Solved by the Invention] However, by such conventional method, on the occasion of recovery or restoration processing, there will surely be free time from an emergency end to recovery or a restoration processing start, and since the state of equipment when an emergency occurs is not known, in order to have to perform general maintenance work, unnecessary time will be spent, and there was a trouble that this led to the fall of production number of sheets.
[0004] The purpose of this invention is to shorten and have the time to the recovery and the return from the abnormal stop of equipment in view of the trouble of such conventional technology in semiconductor fabrication machines and equipment and the device manufacture method using this, and enable it to perform more efficient device manufacture.
[0005]
[Means for Solving the Problem] In order to attain this purpose the semiconductor fabrication machines and equipment of this invention A state acquisition means to acquire the information about the processing stage in the equipment at the time of a halt, and the state of each part of equipment when equipment stops by generating of an emergency (310 380), A detection means to detect that the aforementioned emergency was completed (320, 330, 340), A recovery means to send predetermined instructions to each part of equipment according to the processing stage of the equipment at the time of the aforementioned halt, and to perform recovery (310, 350, 360, 380), After this recovery or in parallel to this recovery, it is characterized by providing a return processing means to send instructions to each part of equipment that each part of equipment should be returned to the state of each part of equipment at the time of the aforementioned halt. Here, the sign in a parenthesis shows the element which corresponds in an example.
[0006] moreover, when equipment stops by generating of an emergency using such semiconductor fabrication machines and equipment, the device manufacture method of this invention The information about the processing stage in the equipment at the time of a halt and the state of each part of equipment

is acquired. Detect it, when an emergency is completed, and after that, according to the processing stage of the equipment at the time of the aforementioned halt, send predetermined instructions to each part of equipment, and recovery is performed. Moreover, after this recovery or in parallel to this recovery, each part of equipment is returned to the state of each part of equipment at the time of the aforementioned halt, and it is characterized by continuing manufacture of a semiconductor device.
[0007]
[Embodiments of the Invention] In the desirable operation gestalt of this invention, the aforementioned detection means detects that the position change was completed, when it has a means to detect the position of equipment and equipment stops by position change. Moreover, the aforementioned return processing means sends the instructions for the aforementioned return, when the aforementioned recovery is completed normally. The aforementioned state acquisition means acquires the information about the processing stage in the equipment at the time of a halt, and the state of each part of equipment from the device-status storing table on which the newest information about the processing stage in equipment and the state of each part of equipment which equipment has when equipment stops by generating of an emergency is stored. Moreover, the aforementioned recovery means has the recovery table which specified the required processing for the recovery to each part of equipment according to the processing stage in the equipment at the time of a halt. Furthermore, when abnormalities become clear in the aforementioned recovery, it has a means to perform the required display related unusually.
[0008] In this composition, when the emergency of a rapid position change causes an earthquake etc. and equipment carries out an abnormal stop, the information about the processing stage in the equipment at that time and the state of each part of equipment is recorded. And an instruction sends [maintaining to the reboot of equipment, and each unit, when it judges that it recovered from the emergency from the detection result of a position detection means, and], the state of each part of equipment recorded when it judged that it is normal as a result and equipment stopped by emergency generating reads, and an instruction is sent [resuming processing and] from the processing in front of emergency generating.
[0009]
[Example] The perspective diagram showing the appearance of the semiconductor fabrication machines and equipment which drawing 1 requires for one example of this invention, and drawing 2 are drawings showing the internal structure of drawing 1 . As shown in this drawing, these semiconductor fabrication machines and equipment are arranged to the ** tone chamber 101 which performs environmental temperature control of the main part of equipment, and its interior. In the display unit 102 for EWS and the main part of equipment which display the predetermined information in the EWS main part 106 and equipment which have CPU which controls the main part of equipment It has the console section containing the control panel 103 for performing a predetermined input to the monitor TV 105 which displays the image information obtained through an image pck-up means, and equipment, and the keyboard 104 grade for EWS. For an emergency stop switch and 109, as for a LAN telecommunication cable and 111, 110, such as various switches and a mouse, is [107 / an ON-OFF switch and 108 / the jet pipe of generation of heat from a console function and 112] the exhausts of a chamber among drawing. The main part of semiconductor fabrication machines and equipment is installed in the interior of a chamber 101. The display 102 for EWS is a thing thin shape flat type [, such as EL, plasma, and liquid crystal,], is dedicated to chamber 101 front face, and is connected with the EWS main part 106 by the LAN cable 110. A control panel 103, a keyboard 104, and monitor TV105 grade are also installed in chamber 101 front face, and enable it to have performed the same console operation as usual from chamber 101 front face.
[0010] In drawing 2 , the stepper as semiconductor fabrication machines and equipment is shown. Among drawing, a reticle and 203 are wafers, and 202 can imprint the pattern on a reticle 202 to the photosensitive layer on a wafer 203 with the projection lens 206, when the flux of light which came out of light equipment 204 illuminates a reticle 202 through the lighting optical system 205. The reticle 202 is supported by the reticle stage 207 for holding a reticle 202 and moving. A wafer 203 is exposed after vacuum adsorption has been carried out by the wafer chuck 291. The wafer chuck 291 is movable to each shaft orientations with the wafer stage 209. The reticle optical system 281 for detecting the amount

of position gaps of a reticle is arranged at the reticle 202 bottom. The projection lens 206 is adjoined above the wafer stage 209, and the off-axis microscope 282 is arranged. It is a main role that the off-axis microscope 282 performs relative-position detection with an internal reference mark and the alignment mark on a wafer 203. Moreover, these stepper main part is adjoined, the reticle library 220 and the wafer carrier elevator 230 which are a peripheral device are arranged, and a required reticle and a required wafer are conveyed by the reticle transport device 221 and the wafer transport device 231 at a stepper main part. The chamber 101 consists of a filter box 213 which filters the air-conditioning cabin 210 and minute foreign matter which mainly perform temperature control of air, and forms the uniform flow of pure air, and a booth 214 which intercepts equipment environment with the exterior. Within a chamber 101, the air by which temperature control was carried out at the condensator 215 and the reheat heater 216 in the air-conditioning cabin 210 is supplied in a booth 214 through an air filter g by the blower 217. From the return mouth ra, the air supplied to this booth 214 is incorporated again in the air-conditioning cabin 210, and circulates through the inside of a chamber 101. Usually, strictly, this chamber 101 has introduced the air outside the booth 214 of about ten percent of the amount of recirculating airs through a blower from the open air inlet oa in which it was prepared in the air-conditioning cabin 210, in order to always maintain the inside of not the perfect circulatory system but the booth 214 at a positive pressure. Thus, it makes it possible for a chamber 101 to keep constant the environmental temperature on which this equipment is put, and to keep air pure. Moreover, in preparation for cooling of a ultrahigh pressure mercury lamp, or poisonous gas generating at the time of laser abnormalities, an inlet port sa and an exhaust port ea are formed in light equipment 204, and the forcible exhaust air of a part of air in a booth 214 is carried out via light equipment 204 at the plant through the ventilating fan of the exclusive use with which the air-conditioning cabin 210 was equipped. Moreover, it connected with the open air inlet oa and the return mouth ra of the air-conditioning cabin 210, respectively, and they are equipped with the chemisorption filter cf for removing the chemical in air. 295 is a damper and has mitigated the shake by vibration etc. from semiconductor fabrication machines and equipment.

[0011] Drawing 3 is the block diagram showing the composition of the portion concerning the processing at the time of emergency generating in these semiconductor fabrication machines and equipment. When each instruction of maintenance processing and recovery is sent to the unit section 370 or equipment stops by emergency generating according to the signal which 310 is the main processing section and has been sent from the signal transceiver section 340 in this drawing The device status at that time is acquired from the device-status storing table 380 at the time of extraordinary generating, and it writes in the device-status storing table 390, or processes sending the information on the device-status storing table 390 to the recovery determination section 350 at the time of extraordinary generating etc. about recovery. 320 is the equipment position measurement section and is attached in the damper 295 of drawing 2 .

[0012] The equipment position measurement section 320 measures the position of the present equipment, and transmits a measurement value to the equipment position change calculation section 330. The equipment position change calculation section 330 calculates position change of equipment from the position measured in the equipment position measurement section 320, and transmits the result to the signal transceiver section 340. The signal transceiver section 340 judges whether based on the position change information sent from the equipment position change calculation section 330, it recovered from the emergency, and sends the result to the main processing section 310 as a signal.

[0013] The recovery determination section 350 reads the data immediately after emergency generating in the device-status storing table 380 at the time of extraordinary generating, chooses required processing from the recovery means table 360 based on the data, and sends the processing information to the main processing section 310. Recovery required for the recovery determination section 350 is stored in the recovery means table 360 as a table. The example of a format of this table is shown in drawing 4 .

[0014] The unit section 370 points out the reticle stage 207 of drawing 2 , the wafer stage 209, a wafer conveyance system, etc. A device status when the signal with which an emergency is expressed from the signal transceiver section 340 is sent to the main processing section 310 is stored in the device-status

storing table 380 via the main processing section 310 from the device-status storing table 390 at the time of extraordinary generating. The newest state of the device status which changes every moment is stored in the device-status storing table 390 in detail. At the time of extraordinary generating, the device-status storing table 380 and the device-status storing table 390 are the same formats fundamentally, and show the example of a format of these tables to drawing 5 .

[0015] Drawing 6 and drawing 7 are flow charts which illustrate processing of the portion concerning the processing at the time of this emergency generating. Drawing 6 is the flow chart of the processing which used the elements 310, 350-390 of drawing 3 , and drawing 7 is the flow chart of the processing which used the elements 320-340 of drawing 3 .

[0016] As shown in drawing 6 , when an emergency occurs, halt processing of equipment is performed and equipment stops, the main processing section 310 stores in the device-status storing table 380 first the device status acquired from the device-status storing table 390 at this time as a device status at the time of extraordinary generating in Step S101 at the time of extraordinary generating. Then, in Step S102, the signal which expresses under a halt to the signal transceiver section 340 is transmitted, and it goes into the equipment idle state of Step S103. In Step S104, the state of Step S103 continues until it receives the signal showing having recovered from the emergency transmitted from a position change sensor (signal transceiver section 340) in Step S205 of drawing 7 . And in Step S104, if this recovery signal is received, it will progress to Step S105 and recovery of equipment will be performed.

[0017] About the recovery which is needed at this time, the recovery determination section 350 is determined based on the data of the recovery means table 360, the result is sent to the main processing section 310, and the main processing section 310 sends an instruction of recovery to each unit section 370. Then, in Step S106, it investigates whether recovery was completed normally. Supposing it has ended normally, it will progress to Step S107 and return processing to the device status at the time of emergency generating will be performed shortly. Also about this return processing, like previous Step S105, the recovery determination section 350 is determined based on the data of the device-status storing table 380 at the time of the recovery means table 360 and extraordinary generating, and sends an instruction of return processing of the main processing section 310 in each unit section 370 based on the result. Then, if it investigated whether return processing was completed normally and has ended normally, it will progress to Step S110 and operation of equipment will be made to resume from a state just before equipment stopped as it is in Step S108. Moreover, when it judges with having not ended normally at Step S106 or Step S108, in Step S109, an error message is carried out so that an operator may understand the part of an error, and recovery or return processing is stopped.

[0018] As shown in drawing 7 , when the signal transceiver section 340 receives the signal about an equipment halt by on the other hand the emergency transmitted in Step S102 having occurred in Step S200, this information is saved until Step S205 is given. When this information is not sent, processing of Step S205 is not performed. If reception of this step S200 is performed, in Step S201, position detection of the present equipment will be performed using the position measurement section 320. Then, in Step S202, calculation of position change is performed using the position change calculation section 330 based on the measurement result of Step S201. Next, in Step S203, the position change calculation result computed at Step S202 is judged using the signal transceiver section 340. Here, since a rapid position change of equipment continues, when it judges with (NG) which has not been recovered from an emergency, it returns to Step S200 as it is, and processing of Steps S200-S202 is repeated.

[0019] In Step S203, a rapid position change of equipment is settled, when it judges with having recovered from the emergency (GOOD), it progresses to Step S204, and equipment investigates whether it is under [halt] ******** now. The signal which expresses under a halt in Step S102 of drawing 6 will be transmitted, this is judged by whether it was saved at Step S200, if this signal is received and being saved, will progress to Step S205 and will transmit an emergency recovery signal to the main processing section 310. At this time, the receipt information of the signal showing under a saved halt is cleared. Moreover, in Step S203, since equipment is still normal when judged with having not received the signal showing under a halt, it returns to Step S200, without performing transmission of the emergency recovery signal in Step S205.

[0020] Below, when the earthquake occurred during exposure explains the case where a rapid position change occurred and equipment stops, as a more concrete example of this processing. When a rapid position change occurs by occurence of earthquakes and equipment stops, the main processing section 310 acquires the state of equipment when an earthquake occurs in Step S101 first, and saves it in the form of drawing 5 . In this example, since the earthquake occurred during exposure, as shown in drawing 5 , 1 (under exposure) goes into the sequence column. Moreover, the position of the wafer stage at this time (this example [x, y] = [+40, -60]), Number of sheets of a wafer (in this example, 25 sheets to the 1st cassette noting that there are two wafer cassettes) Or [it is performing on-line processing to the 2nd cassette zero sheet existence (in this example, it will mean that the cassette is not set), and now (state currently performed in this example)] Information is stored, respectively. Then, in Step S102, it goes into the loop of Step S103 and Step S104 until it transmits the signal which expresses under a halt to a sensor side (signal transceiver section 340), it will be in the state under halt in Step S103 and an emergency recovery signal is sent from a sensor side (i.e., until it receives a recovery signal in Step S104).

[0021] In a sensor side, the signal which expresses under an equipment halt from equipment in Step S200 is received, position detection of equipment is performed at Step S201, and position change is calculated from the result of Step S201 at Step S202. Then, if it judges [whether position change of equipment continues, and] whether it was stood still and position change still continues from the calculation result in Step S202 in Step S203, it will judge with NG, and will return to Step S200, and processing of Steps S201 and S202 will be repeated. If position change is settled, it will judge with GOOD at Step S203, and will progress to Step S204. In Step S204, since the signal which expresses under a halt with Step S200 is received, it judges with YES here and an emergency recovery signal is transmitted to equipment at Step S205.

[0022] According to this, at Step S104, an emergency recovery signal is received and recovery of equipment is performed with reference to the device-status storing table 380 in Step S105 by the equipment side at the time of the recovery means table 360 shown by drawing 4 and drawing 5 , and extraordinary generating. If ID of the sequence of drawing 5 is first seen at this time, since it is 1 (under exposure), the item of "being :1 during exposure" of drawing 4 is referred to. First, since it is O about the wafer stage (W. Stage:A), it processes whether a wafer stage moves normally. It is related with a wafer cassette (W. Cassette1:B, W.Cassette2:C). Since it is **, if it means processing at the time of the need and the item with the still more nearly same drawing 5 is referred to the wafer cassette exists in the direction (1st wafer cassette) of B, and the wafer cassette does not exist in the direction (2nd wafer cassette) of C (0 means that the cassette is not set as mentioned above) -- it is -- It processes whether about the wafer cassette, it is normally set only about the direction of B. Moreover, since it is x about on-line system (OnlineS.:Z), direct recovery is not performed.

[0023] Next, in Step S106, if it judged whether the above recovery was completed normally and has ended normally, it will progress to Step S107 and will move to the return processing to the state at the time of emergency generating. That is, it is made to move to the position of [x, y] = [+40, -60] about a wafer stage from the table of drawing 4 and drawing 5 . Moreover, a wafer is 25-sheet existence (the wafer which has appeared in the present wafer stage is also included) to the wafer cassette of B. It investigates whether it is carrying out. Furthermore, about on-line system, it reboots so that it can resume normally, and the communications processing of host KOMPYUTAHE etc. is given.

[0024] Next, in Step S108, it judges whether the above return processing was completed normally, if it has terminated normally, it will progress to Step S110 and processing of equipment will be resumed, and a series of operation according to this invention is ended. Moreover, when it judges with having terminated abnormally in Step S106 and Step S108, it is the display (the item leading to abnormal termination is included) of an error. It ends without carrying out and performing a restart procedure. As an error message, when two sheets have become less than the time at the time of a halt, since two "wafers run short from the time of a halt, it cannot resume that the wafer fell from the wafer cassette etc., for example." The message to say can be displayed.

[0025] In addition, without being limited to an above-mentioned example, it can deform suitably and

this invention can be carried out. For example, although each portion of 320, 330, and 340 in drawing 3 is attached in an active damper or equipment similar to it, you may make it attach it in the floor to which semiconductor fabrication machines and equipment are installed at the case of semiconductor fabrication machines and equipment not being equipped with the active damper. Moreover, in ****, although it is made to perform recovery and return processing separately, you may be made to perform these processings simultaneously. Moreover, although the object for recoveries and two values for return processing existed in one item in the table of drawing 4 since recovery and return processing were separately performed in **** in that case, you may make it summarize a value in one item by performing recovery and return processing for this simultaneously one. Moreover, in ****, although the case of a rapid position change of the equipment by the earthquake was taken up as an example of emergency generating, when something collides with equipment, this invention can be applied as the same rapid position change. Furthermore, what is necessary is to be able to apply in addition to this, when equipment stops by the rapid fall of voltage by power failure etc., and just to use a voltmeter (ammeter) as detection equipment in that case.

[0026] Next, the example of device manufacture which can use the semiconductor fabrication machines and equipment mentioned above is explained. Drawing 8 shows the flow of manufacture of minute devices (semiconductor chips, such as IC and LSI, a liquid crystal panel, CCD, the thin film magnetic head, micro machine, etc.). The pattern design of a device is performed at Step 1 (circuit design). The mask in which the designed pattern was formed is manufactured at Step 2 (mask manufacture). On the other hand, at Step 3 (wafer manufacture), a wafer is manufactured using material, such as silicon and glass. Step 4 (wafer process) is called last process, and forms an actual circuit on a wafer with lithography technology using the mask and wafer which carried out [above-mentioned] preparation. The following step 5 (assembly) is called back process, is a process semiconductor-chip-ized using the wafer produced by Step 4, and includes processes, such as an assembly process (dicing, bonding) and a packaging process (chip enclosure). At Step 6 (inspection), the check test of the semiconductor device produced at Step 5 of operation, an endurance test, etc. are inspected. A semiconductor device is completed through such a process and this is shipped (Step 7).

[0027] Drawing 9 shows the detailed flow of the above-mentioned wafer process. The front face of a wafer is oxidized at Step 11 (oxidization). An insulator layer is formed in a wafer front face at Step 12 (CVD). At Step 13 (electrode formation), an electrode is formed by vacuum evaporationo on a wafer. Ion is driven into a wafer at Step 14 (ion implantation). A resist is applied to a wafer at Step 15 (resist processing). At Step 16 (exposure), by the aligner or the exposure method which gave [above-mentioned] explanation, the circuit pattern of a mask is arranged in two or more shot fields of a wafer, and printing exposure is carried out. The exposed wafer is developed at Step 17 (development). At Step 18 (etching), portions other than the developed resist image are shaved off. The resist which etching could be managed with Step 19 (resist exfoliation), and became unnecessary is removed. By carrying out by repeating these steps, a circuit pattern is formed on a wafer multiplex.

[0028] According to this, the large-sized device for which manufacture was difficult can be conventionally manufactured by the low cost.

[0029]

[Effect of the Invention] As explained above, according to this invention, the time to the recovery and the return from a halt of the equipment by emergency generating can be shortened, and more efficient device manufacture can be performed. That is, since the automatic maintenance work of recovery and return processing is done when equipment carries out an abnormal stop for emergency generating, the device status at that time is saved and an emergency is completed, when this work is completed normally, processing before emergency generating can be continued as it is. Moreover, since a failure part can be displayed even if an error occurs in maintenance work, unit exchange about the part can be performed smoothly, and the maintenance work according to each situation can be done also with other parts. Therefore, restoration can be performed efficiently and it is effective in this preventing the fall of production number of sheets.

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention acquires the state of the equipment at that time, when emergencies, such as a rapid position change by the earthquake etc., occurred and equipment stops. Then, when it recovers from an emergency, it is related with the device manufacture method using the semiconductor fabrication machines and equipment and this which do automatic maintenance work (restoration processing) based on the processing beforehand set up about each unit of equipment, and perform restart of equipment, and a report of a failure part according to the result.

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PRIOR ART

[Description of the Prior Art] When emergencies, such as a rapid position change by the earthquake etc., occurred and equipment was stopped conventionally, subsequent recovery and subsequent return processing were performed according to the manual with which the inspection person in charge was decided.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, the time to the recovery and the return from a halt of the equipment by emergency generating can be shortened, and more efficient device manufacture can be performed. That is, since the automatic maintenance work of recovery and return processing is done when equipment carries out an abnormal stop for emergency generating, the device status at that time is saved and an emergency is completed, when this work is completed normally, processing before emergency generating can be continued as it is. Moreover, since a failure part can be displayed even if an error occurs in maintenance work, unit exchange about the part can be performed smoothly, and the maintenance work according to each situation can be done also with other parts. Therefore, restoration can be performed efficiently and it is effective in this preventing the fall of production number of sheets.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, by such conventional method, on the occasion of recovery or restoration processing, there will surely be free time from an emergency end to recovery or a restoration processing start, and since the state of equipment when an emergency occurs is not known, in order to have to perform general maintenance work, unnecessary time will be spent, and there was a trouble that this led to the fall of production number of sheets.
[0004] The purpose of this invention is to shorten and have the time to the recovery and the return from the abnormal stop of equipment in view of the trouble of such conventional technology in semiconductor fabrication machines and equipment and the device manufacture method using this, and enable it to perform more efficient device manufacture.

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MEANS

[Means for Solving the Problem] In order to attain this purpose, this invention is characterized by providing the following in semiconductor fabrication machines and equipment. A state acquisition means to acquire the information about the processing stage in the equipment at the time of a halt, and the state of each part of equipment when equipment stops by generating of an emergency (310 380) A detection means to detect that the aforementioned emergency was completed (320, 330, 340) A recovery means to send predetermined instructions to each part of equipment according to the processing stage of the equipment at the time of the aforementioned halt, and to perform recovery (310, 350, 360, 380) A return processing means to send instructions to each part of equipment after this recovery or in parallel to this recovery that each part of equipment should be returned to the state of each part of equipment at the time of the aforementioned halt. Here, the sign in a parenthesis shows the element which corresponds in an example.
[0006] moreover, when equipment stops by generating of an emergency using such semiconductor fabrication machines and equipment, the device manufacture method of this invention The information about the processing stage in the equipment at the time of a halt and the state of each part of equipment is acquired. Detect it, when an emergency is completed, and after that, according to the processing stage of the equipment at the time of the aforementioned halt, send predetermined instructions to each part of equipment, and recovery is performed. Moreover, after this recovery or in parallel to this recovery, each part of equipment is returned to the state of each part of equipment at the time of the aforementioned halt, and it is characterized by continuing manufacture of a semiconductor device.
[0007]
[Embodiments of the Invention] In the desirable operation gestalt of this invention, the aforementioned detection means detects that the position change was completed, when it has a means to detect the position of equipment and equipment stops by position change. Moreover, the aforementioned return processing means sends the instructions for the aforementioned return, when the aforementioned recovery is completed normally. The aforementioned state acquisition means acquires the information about the processing stage in the equipment at the time of a halt, and the state of each part of equipment from the device-status storing table on which the newest information about the processing stage in equipment and the state of each part of equipment which equipment has when equipment stops by generating of an emergency is stored. Moreover, the aforementioned recovery means has the recovery table which specified the required processing for the recovery to each part of equipment according to the processing stage in the equipment at the time of a halt. Furthermore, when abnormalities become clear in the aforementioned recovery, it has a means to perform the required display related unusually.
[0008] In this composition, when the emergency of a rapid position change causes an earthquake etc. and equipment carries out an abnormal stop, the information about the processing stage in the equipment at that time and the state of each part of equipment is recorded. And an instruction sends [maintaining to the reboot of equipment, and each unit, when it judges that it recovered from the emergency from the detection result of a position detection means, and], the state of each part of equipment recorded when it judged that it is normal as a result and equipment stopped by emergency generating reads, and an

instruction is sent [resuming processing and] from the processing in front of emergency generating.

[Translation done.]

* NOTICES *

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EXAMPLE

[Example] The perspective diagram showing the appearance of the semiconductor fabrication machines and equipment which drawing 1 requires for one example of this invention, and drawing 2 are drawings showing the internal structure of drawing 1 . As shown in this drawing, these semiconductor fabrication machines and equipment are arranged to the ** tone chamber 101 which performs environmental temperature control of the main part of equipment, and its interior. In the display unit 102 for EWS and the main part of equipment which display the predetermined information in the EWS main part 106 and equipment which have CPU which controls the main part of equipment It has the console section containing the control panel 103 for performing a predetermined input to the monitor TV 105 which displays the image information obtained through an image pck-up means, and equipment, and the keyboard 104 grade for EWS. For an emergency stop switch and 109, as for a LAN telecommunication cable and 111, 110, such as various switches and a mouse, is [107 / an ON-OFF switch and 108 / the jet pipe of generation of heat from a console function and 112] the exhausts of a chamber among drawing. The main part of semiconductor fabrication machines and equipment is installed in the interior of a chamber 101. The display 102 for EWS is a thing thin shape flat type [, such as EL, plasma, and liquid crystal,], is dedicated to chamber 101 front face, and is connected with the EWS main part 106 by the LAN cable 110. A control panel 103, a keyboard 104, and monitor TV105 grade are also installed in chamber 101 front face, and enable it to have performed the same console operation as usual from chamber 101 front face.
[0010] In drawing 2 , the stepper as semiconductor fabrication machines and equipment is shown. Among drawing, a reticle and 203 are wafers, and 202 can imprint the pattern on a reticle 202 to the photosensitive layer on a wafer 203 with the projection lens 206, when the flux of light which came out of light equipment 204 illuminates a reticle 202 through the lighting optical system 205. The reticle 202 is supported by the reticle stage 207 for holding a reticle 202 and moving. A wafer 203 is exposed after vacuum adsorption has been carried out by the wafer chuck 291. The wafer chuck 291 is movable to each shaft orientations with the wafer stage 209. The reticle optical system 281 for detecting the amount of position gaps of a reticle is arranged at the reticle 202 bottom. The projection lens 206 is adjoined above the wafer stage 209, and the off-axis microscope 282 is arranged. It is a main role that the off-axis microscope 282 performs relative-position detection with an internal reference mark and the alignment mark on a wafer 203. Moreover, these stepper main part is adjoined, the reticle library 220 and the wafer carrier elevator 230 which are a peripheral device are arranged, and a required reticle and a required wafer are conveyed by the reticle transport device 221 and the wafer transport device 231 at a stepper main part. The chamber 101 consists of a filter box 213 which filters the air-conditioning cabin 210 and minute foreign matter which mainly perform temperature control of air, and forms the uniform flow of pure air, and a booth 214 which intercepts equipment environment with the exterior. Within a chamber 101, the air by which temperature control was carried out at the condensator 215 and the reheat heater 216 in the air-conditioning cabin 210 is supplied in a booth 214 through an air filter g by the blower 217. From the return mouth ra, the air supplied to this booth 214 is incorporated again in the air-conditioning cabin 210, and circulates through the inside of a chamber 101. Usually, strictly, this chamber 101 has

introduced the air outside the booth 214 of about ten percent of the amount of recirculating airs through a blower from the open air inlet oa in which it was prepared in the air-conditioning cabin 210, in order to always maintain the inside of not the perfect circulatory system but the booth 214 at a positive pressure. Thus, it makes it possible for a chamber 101 to keep constant the environmental temperature on which this equipment is put, and to keep air pure. Moreover, in preparation for cooling of a ultrahigh pressure mercury lamp, or poisonous gas generating at the time of laser abnormalities, an inlet port sa and an exhaust port ea are formed in light equipment 204, and the forcible exhaust air of a part of air in a booth 214 is carried out via light equipment 204 at the plant through the ventilating fan of the exclusive use with which the air-conditioning cabin 210 was equipped. Moreover, it connected with the open air inlet oa and the return mouth ra of the air-conditioning cabin 210, respectively, and they are equipped with the chemisorption filter cf for removing the chemical in air. 295 is a damper and has mitigated the shake by vibration etc. from semiconductor fabrication machines and equipment.

[0011] Drawing 3 is the block diagram showing the composition of the portion concerning the processing at the time of emergency generating in these semiconductor fabrication machines and equipment. When each instruction of maintenance processing and recovery is sent to the unit section 370 or equipment stops by emergency generating according to the signal which 310 is the main processing section and has been sent from the signal transceiver section 340 in this drawing The device status at that time is acquired from the device-status storing table 380 at the time of extraordinary generating, and it writes in the device-status storing table 390, or processes sending the information on the device-status storing table 390 to the recovery determination section 350 at the time of extraordinary generating etc. about recovery. 320 is the equipment position measurement section and is attached in the damper 295 of drawing 2 .

[0012] The equipment position measurement section 320 measures the position of the present equipment, and transmits a measurement value to the equipment position change calculation section 330. The equipment position change calculation section 330 calculates position change of equipment from the position measured in the equipment position measurement section 320, and transmits the result to the signal transceiver section 340. The signal transceiver section 340 judges whether based on the position change information sent from the equipment position change calculation section 330, it recovered from the emergency, and sends the result to the main processing section 310 as a signal.

[0013] The recovery determination section 350 reads the data immediately after emergency generating in the device-status storing table 380 at the time of extraordinary generating, chooses required processing from the recovery means table 360 based on the data, and sends the processing information to the main processing section 310. Recovery required for the recovery determination section 350 is stored in the recovery means table 360 as a table. The example of a format of this table is shown in drawing 4 .

[0014] The unit section 370 points out the reticle stage 207 of drawing 2 , the wafer stage 209, a wafer conveyance system, etc. A device status when the signal with which an emergency is expressed from the signal transceiver section 340 is sent to the main processing section 310 is stored in the device-status storing table 380 via the main processing section 310 from the device-status storing table 390 at the time of extraordinary generating. The newest state of the device status which changes every moment is stored in the device-status storing table 390 in detail. At the time of extraordinary generating, the device-status storing table 380 and the device-status storing table 390 are the same formats fundamentally, and show the example of a format of these tables to drawing 5 .

[0015] Drawing 6 and drawing 7 are flow charts which illustrate processing of the portion concerning the processing at the time of this emergency generating. Drawing 6 is the flow chart of the processing which used the elements 310, 350-390 of drawing 3 , and drawing 7 is the flow chart of the processing which used the elements 320-340 of drawing 3 .

[0016] As shown in drawing 6 , when an emergency occurs, halt processing of equipment is performed and equipment stops, the main processing section 310 stores in the device-status storing table 380 first the device status acquired from the device-status storing table 390 at this time as a device status at the time of extraordinary generating in Step S101 at the time of extraordinary generating. Then, in Step

S102, the signal which expresses under a halt to the signal transceiver section 340 is transmitted, and it goes into the equipment idle state of Step S103. In Step S104, the state of Step S103 continues until it receives the signal showing having recovered from the emergency transmitted from a position change sensor (signal transceiver section 340) in Step S205 of drawing 7 . And in Step S104, if this recovery signal is received, it will progress to Step S105 and recovery of equipment will be performed.
[0017] About the recovery which is needed at this time, the recovery determination section 350 is determined based on the data of the recovery means table 360, the result is sent to the main processing section 310, and the main processing section 310 sends an instruction of recovery to each unit section 370. Then, in Step S106, it investigates whether recovery was completed normally. Supposing it has ended normally, it will progress to Step S107 and return processing to the device status at the time of emergency generating will be performed shortly. Also about this return processing, like previous Step S105, the recovery determination section 350 is determined based on the data of the device-status storing table 380 at the time of the recovery means table 360 and extraordinary generating, and sends an instruction of return processing of the main processing section 310 in each unit section 370 based on the result. Then, if it investigated whether return processing was completed normally and has ended normally, it will progress to Step S110 and operation of equipment will be made to resume from a state just before equipment stopped as it is in Step S108. Moreover, when it judges with having not ended normally at Step S106 or Step S108, in Step S109, an error message is carried out so that an operator may understand the part of an error, and recovery or return processing is stopped.
[0018] As shown in drawing 7 , when the signal transceiver section 340 receives the signal about an equipment halt by on the other hand the emergency transmitted in Step S102 having occurred in Step S200, this information is saved until Step S205 is given. When this information is not sent, processing of Step S205 is not performed. If reception of this step S200 is performed, in Step S201, position detection of the present equipment will be performed using the position measurement section 320. Then, in Step S202, calculation of position change is performed using the position change calculation section 330 based on the measurement result of Step S201. Next, in Step S203, the position change calculation result computed at Step S202 is judged using the signal transceiver section 340. Here, since a rapid position change of equipment continues, when it judges with (NG) which has not been recovered from an emergency, it returns to Step S200 as it is, and processing of Steps S200-S202 is repeated.
[0019] In Step S203, a rapid position change of equipment is settled, when it judges with having recovered from the emergency (GOOD), it progresses to Step S204, and equipment investigates whether it is under [halt] ******** now. The signal which expresses under a halt in Step S102 of drawing 6 will be transmitted, this is judged by whether it was saved at Step S200, if this signal is received and being saved, will progress to Step S205 and will transmit an emergency recovery signal to the main processing section 310. At this time, the receipt information of the signal showing under a saved halt is cleared. Moreover, in Step S203, since equipment is still normal when judged with having not received the signal showing under a halt, it returns to Step S200, without performing transmission of the emergency recovery signal in Step S205.
[0020] Below, when the earthquake occurred during exposure explains the case where a rapid position change occurred and equipment stops, as a more concrete example of this processing. When a rapid position change occurs by occurence of earthquakes and equipment stops, the main processing section 310 acquires the state of equipment when an earthquake occurs in Step S101 first, and saves it in the form of drawing 5 . In this example, since the earthquake occurred during exposure, as shown in drawing 5 , 1 (under exposure) goes into the sequence column. Moreover, the position of the wafer stage at this time (this example [x, y] = [+40, -60]), Number of sheets of a wafer (in this example, 25 sheets to the 1st cassette noting that there are two wafer cassettes) Or [it is performing on-line processing to the 2nd cassette zero sheet existence (in this example, it will mean that the cassette is not set), and now (state currently performed in this example)] Information is stored, respectively. Then, in Step S102, it goes into the loop of Step S103 and Step S104 until it transmits the signal which expresses under a halt to a sensor side (signal transceiver section 340), it will be in the state under halt in Step S103 and an emergency recovery signal is sent from a sensor side (i.e., until it receives a recovery signal in Step

S104).
[0021] In a sensor side, the signal which expresses under an equipment halt from equipment in Step S200 is received, position detection of equipment is performed at Step S201, and position change is calculated from the result of Step S201 at Step S202. Then, if it judges [whether position change of equipment continues, and] whether it was stood still and position change still continues from the calculation result in Step S202 in Step S203, it will judge with NG, and will return to Step S200, and processing of Steps S201 and S202 will be repeated. If position change is settled, it will judge with GOOD at Step S203, and will progress to Step S204. In Step S204, since the signal which expresses under a halt with Step S200 is received, it judges with YES here and an emergency recovery signal is transmitted to equipment at Step S205.
[0022] According to this, at Step S104, an emergency recovery signal is received and recovery of equipment is performed with reference to the device-status storing table 380 in Step S105 by the equipment side at the time of the recovery means table 360 shown by drawing 4 and drawing 5 , and extraordinary generating. If ID of the sequence of drawing 5 is first seen at this time, since it is 1 (under exposure), the item of "being :1 during exposure" of drawing 4 is referred to. First, since it is O about the wafer stage (W. Stage:A), it processes whether a wafer stage moves normally. It is related with a wafer cassette (W. Cassette1:B, W.Cassette2:C). Since it is **, if it means processing at the time of the need and the item with the still more nearly same drawing 5 is referred to the wafer cassette exists in the direction (1st wafer cassette) of B, and the wafer cassette does not exist in the direction (2nd wafer cassette) of C (0 means that the cassette is not set as mentioned above) -- it is -- It processes whether about the wafer cassette, it is normally set only about the direction of B. Moreover, since it is x about on-line system (OnlineS.:Z), direct recovery is not performed.
[0023] Next, in Step S106, if it judged whether the above recovery was completed normally and has ended normally, it will progress to Step S107 and will move to the return processing to the state at the time of emergency generating. That is, it is made to move to the position of [x, y] = [+40, -60] about a wafer stage from the table of drawing 4 and drawing 5 . Moreover, a wafer is 25-sheet existence (the wafer which has appeared in the present wafer stage is also included) to the wafer cassette of B. It investigates whether it is carrying out. Furthermore, about on-line system, it reboots so that it can resume normally, and the communications processing of host KOMPYUTAHE etc. is given.
[0024] Next, in Step S108, it judges whether the above return processing was completed normally, if it has terminated normally, it will progress to Step S110 and processing of equipment will be resumed, and a series of operation according to this invention is ended. Moreover, when it judges with having terminated abnormally in Step S106 and Step S108, it is the display (the item leading to abnormal termination is included) of an error. It ends without carrying out and performing a restart procedure. As an error message, when two sheets have become less than the time at the time of a halt, since two "wafers run short from the time of a halt, it cannot resume that the wafer fell from the wafer cassette etc., for example." The message to say can be displayed.
[0025] In addition, without being limited to an above-mentioned example, it can deform suitably and this invention can be carried out. For example, although each portion of 320, 330, and 340 in drawing 3 is attached in an active damper or equipment similar to it, you may make it attach it in the floor to which semiconductor fabrication machines and equipment are installed at the case of semiconductor fabrication machines and equipment not being equipped with the active damper. Moreover, in ****, although it is made to perform recovery and return processing separately, you may be made to perform these processings simultaneously. Moreover, although the object for recoveries and two values for return processing existed in one item in the table of drawing 4 since recovery and return processing were separately performed in **** in that case, you may make it summarize a value in one item by performing recovery and return processing for this simultaneously one. Moreover, in ****, although the case of a rapid position change of the equipment by the earthquake was taken up as an example of emergency generating, when something collides with equipment, this invention can be applied as the same rapid position change. Furthermore, what is necessary is to be able to apply in addition to this, when equipment stops by the rapid fall of voltage by power failure etc., and just to use a voltmeter

(ammeter) as detection equipment in that case.
[0026] Next, the example of device manufacture which can use the semiconductor fabrication machines and equipment mentioned above is explained. Drawing 8 shows the flow of manufacture of minute devices (semiconductor chips, such as IC and LSI, a liquid crystal panel, CCD, the thin film magnetic head, micro machine, etc.). The pattern design of a device is performed at Step 1 (circuit design). The mask in which the designed pattern was formed is manufactured at Step 2 (mask manufacture). On the other hand, at Step 3 (wafer manufacture), a wafer is manufactured using material, such as silicon and glass. Step 4 (wafer process) is called last process, and forms an actual circuit on a wafer with lithography technology using the mask and wafer which carried out [above-mentioned] preparation. The following step 5 (assembly) is called back process, is a process semiconductor-chip-ized using the wafer produced by Step 4, and includes processes, such as an assembly process (dicing, bonding) and a packaging process (chip enclosure). At Step 6 (inspection), the check test of the semiconductor device produced at Step 5 of operation, an endurance test, etc. are inspected. A semiconductor device is completed through such a process and this is shipped (Step 7).
[0027] Drawing 9 shows the detailed flow of the above-mentioned wafer process. The front face of a wafer is oxidized at Step 11 (oxidization). An insulator layer is formed in a wafer front face at Step 12 (CVD). At Step 13 (electrode formation), an electrode is formed by vacuum evaporationo on a wafer. Ion is driven into a wafer at Step 14 (ion implantation). A resist is applied to a wafer at Step 15 (resist processing). At Step 16 (exposure), by the aligner or the exposure method which gave [above-mentioned] explanation, the circuit pattern of a mask is arranged in two or more shot fields of a wafer, and printing exposure is carried out. The exposed wafer is developed at Step 17 (development). At Step 18 (etching), portions other than the developed resist image are shaved off. The resist which etching could be managed with Step 19 (resist exfoliation), and became unnecessary is removed. By carrying out by repeating these steps, a circuit pattern is formed on a wafer multiplex.
[0028] According to this, the large-sized device for which manufacture was difficult can be conventionally manufactured by the low cost.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective diagram showing the appearance of the semiconductor fabrication machines and equipment concerning one example of this invention.
[Drawing 2] It is drawing showing the internal structure of the equipment of drawing 1 .
[Drawing 3] It is the block diagram showing the composition of the portion concerning the processing at the time of emergency generating in the equipment of drawing 1 .
[Drawing 4] It is drawing showing the recovery means table in the composition of drawing 3 .
[Drawing 5] It is drawing showing the time of an equipment halt by emergency generating in the composition of drawing 3 , and the newest device-status table.
[Drawing 6] It is the flow chart which shows the processing by the side of the equipment in the composition of drawing 3 .
[Drawing 7] It is the flow chart which shows the processing by the side of the position change sensor in the composition of drawing 3 .
[Drawing 8] It is the flow chart which shows the example of device manufacture which can use the equipment or the method of this invention.
[Drawing 9] It is the flow chart which shows the detailed flow of the wafer process in drawing 8 .
[Description of Notations]
A ** tone chamber, the display unit for 102:EWS, 103 : 101: A control panel, 104: The keyboard for EWS, 105 : Monitor TV, a 106:EWS main part, 107: An ON-OFF switch, a 108:emergency stop switch, 109 : Various switches, 110:LAN telecommunication cables, such as a mouse, a 111:jet pipe, 112 : The exhaust, 202 : A reticle, a 203:wafer, 204:light equipment, 205:lighting optical system, 206: A projection lens, a 207:reticle stage, 209 : A wafer stage, 210: An air-conditioning cabin, a 213:filter box, a 214:booth, 217 : A blower, 281: A reticle microscope, a 282:off-axis microscope, 295 : A damper, 310: The main processing section, the 320:equipment position measurement section, 330 : The equipment position change calculation section, 340: The signal transceiver section, the 350:recovery determination section, 360 : A recovery means table, the time of 370:unit section and 380:extraordinary generating -- a device-status storing table and 390: -- a device-status storing table, g:air filter, cf:chemisorption filter, oa:open air inlet, and a ra:return mouth

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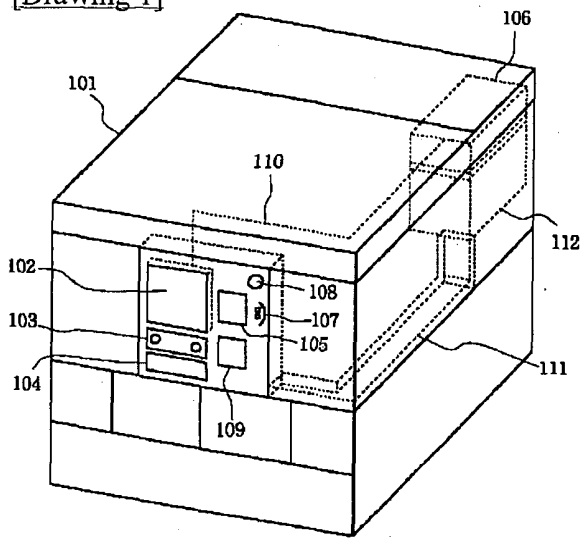
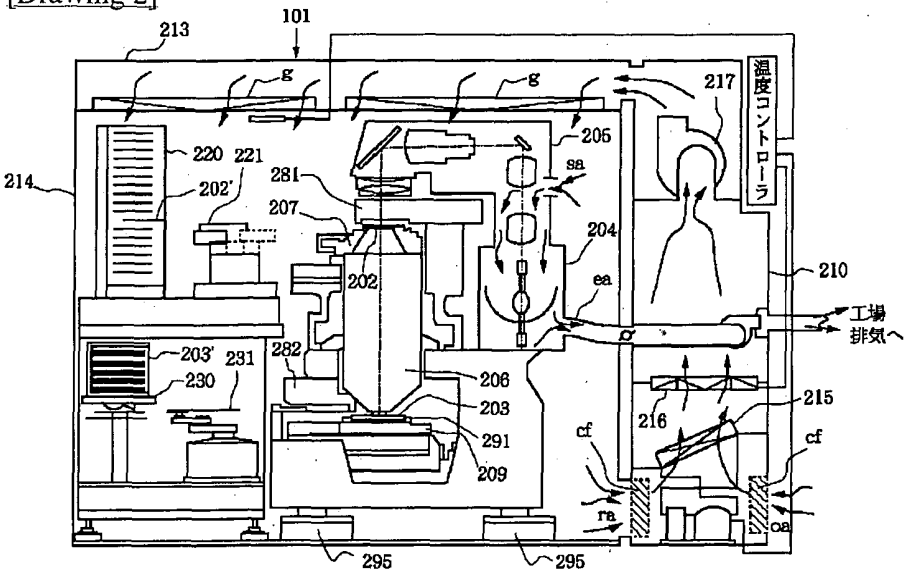
DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 4]

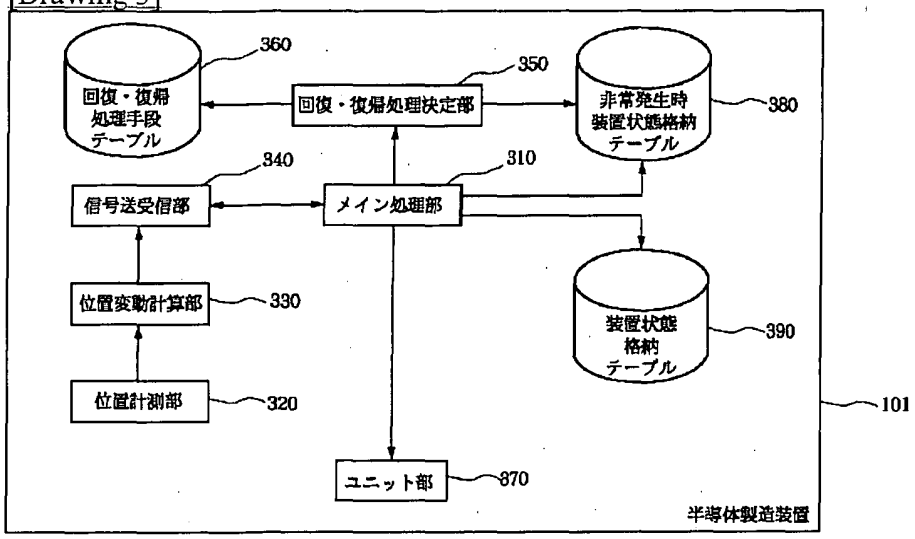
(1) \ (2)	W.Stage : A	W.Cassette1 : B	W.Cassette2 : C	...	Online S. : Z
露光中 : 1	○ : X1,Y1	△ : N11	△ : N21		× : Flag1
待機 : 2	○ : X2,Y2	△ : N12	△ : N22		× : Flag2
:					
精度計測 : N	○ : Xn,Yn	△ : N1n	△ : N2n		× : Flagn

(1) : シーケンス : ID

(2) : ユニット : ID

W : Wafer,S. : System

[Drawing 3]



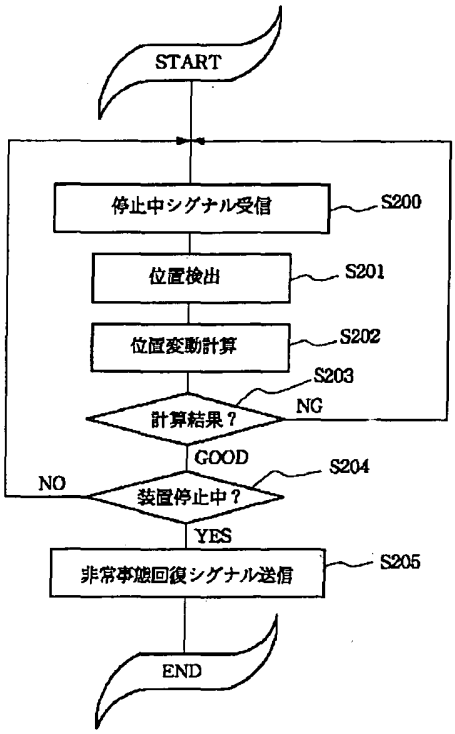
[Drawing 5]

(1) \ (2)	A	B	C	...	Z
1	+40,−60	25	0		○

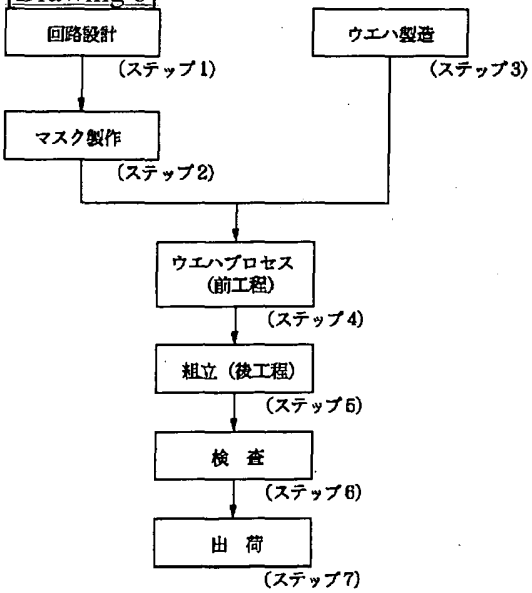
(1) : シーケンス : ID

(2) : ユニット : ID

[Drawing 7]

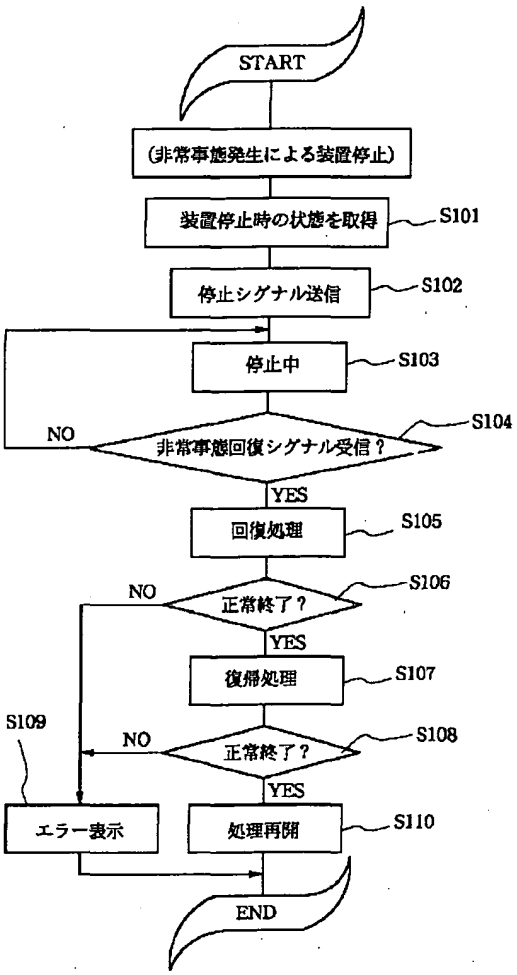


[Drawing 8]

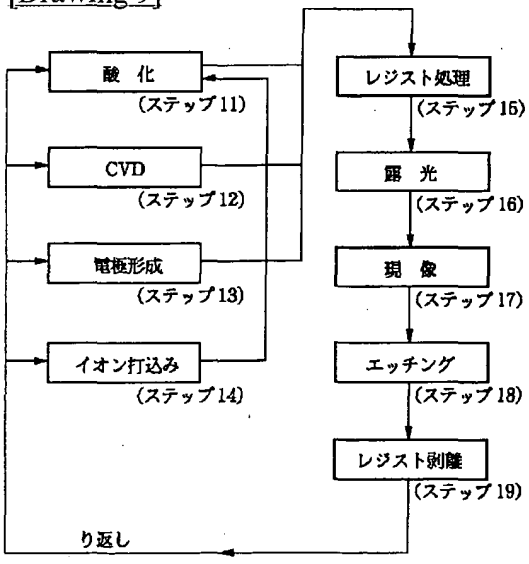


半導体デバイス製造フロー

[Drawing 6]



[Drawing 9]



ウエハプロセス

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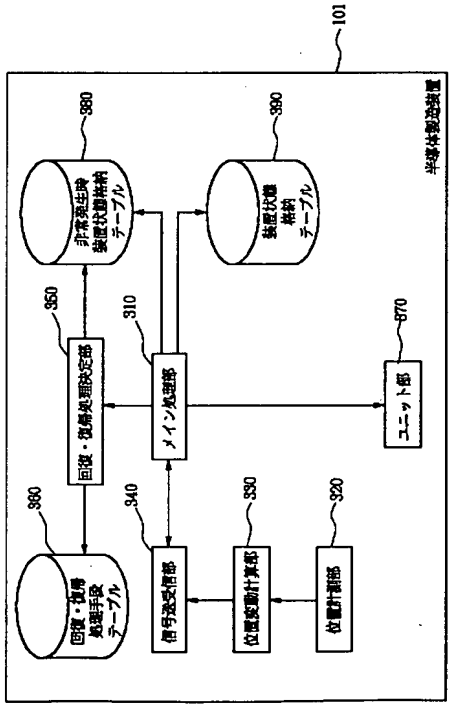
(54)【発明の名称】　半導体製造装置およびデバイス製造方法

(57)【要約】

【課題】　非常事態の発生による装置の停止からの回復・復帰までの時間を短縮し、より効率的なデバイス製造が行えるようにする。

【解決手段】　非常事態の発生により装置が停止したときに停止時における装置での処理段階および装置各部の状態に関する情報を取得する状態取得手段３１０、３８０と、前記非常事態が終了したことを検出する検出手段３２０、３３０、３４０と、前記停止時における装置の処理段階に応じて装置各部に所定の指令を送り回復処理を行う回復処理手段３１０、３５０、３６０、３８０と、この回復処理の後あるいはこの回復処理と並行して、前記停止時の装置各部の状態に装置各部を復帰させるべく装置各部に指令を送る復帰処理手段とを備える。



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【特許請求の範囲】

【請求項１】　非常事態の発生により装置が停止したときに停止時における装置での処理段階および装置各部の状態に関する情報を取得する状態取得手段と、

前記非常事態が終了したことを検出する検出手段と、前記停止時における装置の処理段階に応じて装置各部に所定の指令を送り回復処理を行う回復処理手段と、

この回復処理の後あるいはこの回復処理と並行して、前記停止時の装置各部の状態に装置各部を復帰させるべく装置各部に指令を送る復帰処理手段とを具備することを特徴とする半導体製造装置。

【請求項２】　前記検出手段は、装置の位置を検出する手段を有し、装置が位置変動により停止した場合に、その位置変動が停止したことを検出するものであることを特徴とする請求項１に記載の半導体露光装置。

【請求項３】　前記復帰処理手段は、前記回復処理が正常に終了した場合に前記復帰のための指令を送るものであることを特徴とする請求項１または２に記載の半導体製造装置。

【請求項４】　前記状態取得手段は、非常事態の発生により装置が停止したときに、装置が有する、装置での処理段階および装置各部の状態に関する最新の情報が格納される装置状態格納テーブルから、停止時における装置での処理段階および装置各部の状態に関する情報を取得するものであり、前記回復処理手段は、

非常事態の発生により装置が停止したときにおける装置での処理段階に応じた装置各部に対する回復処理のための必要な処理を規定した回復処理テーブルを有するものであることを特徴とする請求項１～３のいずれか１項に記載の半導体製造装置。

【請求項５】　前記回復処理において異常が判明したときは、その異常に関する必要な表示を行う手段を有することを特徴とする請求項１～４のいずれか１項に記載の半導体製造装置。

【請求項６】　請求項１～５のいずれかの半導体製造装置を用い、非常事態の発生により装置が停止したときには、停止時における装置での処理段階および装置各部の状態に関する情報を取得し、非常事態が終了したときにはそれを検出し、その後、前記停止時における装置の処理段階に応じて装置各部に所定の指令を送って回復処理を行い、また、この回復処理の後あるいはこの回復処理と並行して前記停止時の装置各部の状態に装置各部を復帰させ、そして半導体デバイスの製造を続行することを特徴とするデバイス製造方法。

【発明の詳細な説明】

【０００１】

【発明が属する技術分野】本発明は、地震などによる急激な位置変動などの非常事態が発生したことによって装置が停止したとき、そのときの装置の状態を取得し、その後、非常時から回復した場合に、装置の各ユニットに

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関してあらかじめ設定してある処理に基づき自動メンテナンス作業（復旧処理）を行い、その結果に応じて装置の再始動、故障箇所の報告を行う半導体製造装置およびこれを用いたデバイス製造方法に関する。

【０００２】

【従来の技術】従来、地震などによる急激な位置変動などの非常事態が発生して、装置を停止させたとき、その後の回復処理や復帰処理は、検査担当者が決められたマニュアルに従って行っていた。

【０００３】

【発明が解決しようとする課題】しかしながら、このような従来の方法では、回復処理や復旧処理に際して、非常事態終了から回復処理または復旧処理開始まで時間がどうしても空いてしまうし、非常事態が発生したときの装置の状態が分らないために一通りのメンテナンス作業を施さねばならないため、不要な時間を費すことになり、これが生産枚数の低下につながるといった問題点があった。

【０００４】本発明の目的は、このような従来技術の問題点に鑑み、半導体製造装置およびこれを用いたデバイス製造方法において、装置の異常停止からの回復・復帰までの時間を短縮し、もって、より効率的なデバイス製造が行えるようにすることにある。

【０００５】

【課題を解決するための手段】この目的を達成するため本発明の半導体製造装置は、非常事態の発生により装置が停止したときに停止時における装置での処理段階および装置各部の状態に関する情報を取得する状態取得手段（３１０、３８０）と、前記非常事態が終了したことを検出する検出手段（３２０、３３０、３４０）と、前記停止時における装置の処理段階に応じて装置各部に所定の指令を送り回復処理を行う回復処理手段（３１０、３５０、３６０、３８０）と、この回復処理の後あるいはこの回復処理と並行して、前記停止時の装置各部の状態に装置各部を復帰させるべく装置各部に指令を送る復帰処理手段とを具備することを特徴とする。ここで、括弧内の符号は実施例において対応する要素を示す。

【０００６】また、本発明のデバイス製造方法は、このような半導体製造装置を用い、非常事態の発生により装置が停止したときには、停止時における装置での処理段階および装置各部の状態に関する情報を取得し、非常事態が終了したときにはそれを検出し、その後、前記停止時における装置の処理段階に応じて装置各部に所定の指令を送って回復処理を行い、また、この回復処理の後あるいはこの回復処理と並行して前記停止時の装置各部の状態に装置各部を復帰させ、そして半導体デバイスの製造を続行することを特徴とする。

【０００７】

【発明の実施の形態】本発明の好ましい実施形態においては、前記検出手段は、装置の位置を検出する手段を有

し、装置が位置変動により停止した場合に、その位置変動が終了したことを検出するものである。また、前記復帰処理手段は、前記回復処理が正常に終了した場合に前記復帰のための指令を送る。前記状態取得手段は、非常事態の発生により装置が停止したときに、例えば、装置が有する、装置での処理段階および装置各部の状態に関する最新の情報が格納される装置状態格納テーブルから、停止時における装置での処理段階および装置各部の状態に関する情報を取得する。また、前記回復処理手段は、停止時における装置での処理段階に応じた装置各部に対する回復処理のための必要な処理を規定した回復処理テーブルを有する。さらに、前記回復処理において異常が判明したときは、その異常に関する必要な表示を行う手段を有する。

【０００８】この構成において、地震など急激な位置変動の非常事態が発生するなどして装置が異常停止したとき、そのときの装置での処理段階および装置各部の状態に関する情報が記録される。そして、位置検出手段の検出結果から、非常事態から回復したと判断したときは、装置の再起動や、各ユニットにメンテナンスを施すよう命令を送り、その結果異常がないと判断したときは、非常事態発生により装置が停止した時に記録しておいた装置各部の状態を読み込み、非常事態発生直前の処理から処理を再開するよう命令が送られる。

【０００９】

【実施例】図１は本発明の一実施例に係る半導体製造装置の外観を示す斜視図、図２は図１の内部構造を示す図である。同図に示すように、この半導体製造装置は、装置本体の環境温度制御を行う温調チャンバ１０１、その内部に配置され、装置本体の制御を行うＣＰＵを有するＥＷＳ本体１０６、装置における所定の情報を表示するＥＷＳ用ディスプレイ装置１０２、装置本体において撮像手段を介して得られる画像情報を表示するモニタＴＶ１０５、装置に対し所定の入力を行うための操作パネル１０３、ＥＷＳ用キーボード１０４等を含むコンソール部を備えている。図中、１０７はＯＮ－ＯＦＦスイッチ、１０８は非常停止スイッチ、１０９は各種スイッチ、マウス等、１１０はＬＡＮ通信ケーブル、１１１はコンソール機能からの発熱の排気ダクト、そして１１２はチャンバの排気装置である。半導体製造装置本体はチャンバ１０１の内部に設置される。ＥＷＳ用ディスプレイ１０２は、ＥＬ、プラズマ、液晶等の薄型フラットタイプのものであり、チャンバ１０１前面に納められ、ＬＡＮケーブル１１０によりＥＷＳ本体１０６と接続される。操作パネル１０３、キーボード１０４、モニタＴＶ１０５等もチャンバ１０１前面に設置し、チャンバ１０１前面から従来と同様のコンソール操作が行えるようにしてある。

【００１０】図２においては、半導体製造装置としてのステッパが示されている。図中、２０２はレチクル、２０３はウエハであり、光源装置２０４から出た光束が照明光学系２０５を通ってレチクル２０２を照明するとき、投影レンズ２０６によりレチクル２０２上のパターンをウエハ２０３上の感光層に転写することができる。レチクル２０２はレチクル２０２を保持、移動するためのレチクルステージ２０７により支持されている。ウエハ２０３はウエハチャック２９１により真空吸着された状態で露光される。ウエハチャック２９１はウエハステージ２０９により各軸方向に移動可能である。レチクル２０２の上側にはレチクルの位置ずれ量を検出するためのレチクル光学系２８１が配置される。ウエハステージ２０９の上方に、投影レンズ２０６に隣接してオフアクシス顕微鏡２８２が配置されている。オフアクシス顕微鏡２８２は内部の基準マークとウエハ２０３上のアライメントマークとの相対位置検出を行うのが主たる役割である。また、これらステッパ本体に隣接して周辺装置であるレチクルライブラリ２２０やウエハキャリアエレベータ２３０が配置され、必要なレチクルやウエハはレチクル搬送装置２２１およびウエハ搬送装置２３１によってステッパ本体に搬送される。チャンバ１０１は、主に空気の温度調節を行う空調機室２１０および微小異物を濾過し清浄空気の均一な流れを形成するフィルタボックス２１３、また装置環境を外部と遮断するブース２１４で構成されている。チャンバ１０１内では、空調機室２１０内にある冷却器２１５および再熱ヒータ２１６により温度調節された空気が、送風機２１７によりエアフィルタｇを介してブース２１４内に供給される。このブース２１４に供給された空気はリターンロｒａより再度空調機室２１０に取り込まれチャンバ１０１内を循環する。通常、このチャンバ１０１は厳密には完全な循環系ではなく、ブース２１４内を常時陽圧に保つために循環空気量の約１割のブース２１４外の空気を空調機室２１０に設けられた外気導入口ｏａより送風機を介して導入している。このようにしてチャンバ１０１は本装置の置かれる環境温度を一定に保ち、かつ空気を清浄に保つことを可能にしている。また光源装置２０４には超高圧水銀灯の冷却やレーザ異常時の有毒ガス発生に備えて吸気口ｓａと排気口ｅａが設けられ、ブース２１４内の空気の一部が光源装置２０４を経由し、空調機室２１０に備えられた専用の排気ファンを介して工場設備に強制排気されている。また、空気中の化学物質を除去するための化学吸着フィルタｃｆを、空調機室２１０の外気導入口ｏａおよびリターンロｒａにそれぞれ接続して備えている。２９５はダンパであり、半導体製造装置から振動などによる揺れを軽減している。

【００１１】図３はこの半導体製造装置における非常事態発生時の処理に係る部分の構成を示すブロック図である。同図において、３１０はメイン処理部であり、信号送受信部３４０から送られて来た信号に応じてユニット部３７０にメンテナンス処理や回復処理の各命令を送っ

たり、非常事態発生により装置が停止したときに、そのときの装置状態を非常発生時装置状態格納テーブル３８０から取得して、装置状態格納テーブル３９０に書き込んだり、回復処理に関しては、非常発生時装置状態格納テーブル３９０の情報を回復処理決定部３５０に送る等の処理を行う。３２０は装置位置計測部であり、図２のダンパ２９５に取り付けられている。

【００１２】装置位置計測部３２０は現在の装置の位置を計測し、装置位置変動計算部３３０に計測値を送信する。装置位置変動計算部３３０は、装置位置計測部３２０で計測した位置から装置の位置変動を計算し、その結果を信号送受信部３４０に送信する。信号送受信部３４０は、装置位置変動計算部３３０から送られた位置変動情報に基づき非常時から回復したかどうかを判断し、その結果をメイン処理部３１０に信号として送る。

【００１３】回復処理決定部３５０は、非常発生時装置状態格納テーブル３８０から非常時発生直後のデータを読み取り、そのデータに基づき、回復処理手段テーブル３６０から必要な処理を選択してその処理情報をメイン処理部３１０に送る。回復処理手段テーブル３６０には、回復処理決定部３５０に必要な回復処理がテーブルとして格納されている。このテーブルのフォーマット例を図４に示す。

【００１４】ユニット部３７０は、図２のレチクルステージ２０７やウエハステージ２０９、ウエハ搬送系などを指す。非常発生時装置状態格納テーブル３８０には、信号送受信部３４０から非常を表す信号がメイン処理部３１０に送られたときの装置状態が、装置状態格納テーブル３９０からメイン処理部３１０を経由して格納される。装置状態格納テーブル３９０には、刻々と変わる装置状態の最新状態が逐一格納される。非常発生時装置状態格納テーブル３８０と装置状態格納テーブル３９０は基本的に同じフォーマットであり、これらテーブルのフォーマット例を図５に示す。

【００１５】図６および図７は、この非常事態発生時の処理に係る部分の処理を例示するフローチャートである。図６は、図３の要素３１０、３５０～３９０を用いた処理のフローチャートであり、図７は、図３の要素３２０～３４０を用いた処理のフローチャートである。

【００１６】図６に示すように、非常事態が発生して装置の停止処理が行われ、装置が停止したとき、メイン処理部３１０はまず、ステップＳ１０１において、このときに装置状態格納テーブル３９０から取得した装置状態を、非常発生時の装置状態として非常発生時装置状態格納テーブル３８０に格納する。その後、ステップＳ１０２において、信号送受信部３４０に停止中を表すシグナルを送信して、ステップＳ１０３の装置停止状態に入る。ステップＳ１０４において、図７のステップＳ２０５において位置変動センサ（信号送受信部３４０）から送信される、非常時から回復したことを表すシグナルを受信するまでステップＳ１０３の状態が続く。そして、ステップＳ１０４において、この回復シグナルを受信したら、ステップＳ１０５へ進み、装置の回復処理を行う。

【００１７】このときに、必要となる回復処理については、回復処理決定部３５０が回復処理手段テーブル３６０のデータを元に決定し、その結果をメイン処理部３１０に送り、メイン処理部３１０が、各ユニット部３７０に回復処理の命令を送る。この後、ステップＳ１０６において、正常に回復処理が終了したか否かを調べる。もし正常に終了していたら、ステップＳ１０７へ進み、今度は非常事態発生時における装置状態への復帰処理を行う。この復帰処理に関しても、先程のステップＳ１０５のように回復処理決定部３５０が回復処理手段テーブル３６０および非常発生時装置状態格納テーブル３８０のデータを元に決定し、その結果に基づきメイン処理部３１０が各ユニット部３７０に復帰処理の命令を送る。この後、ステップＳ１０８において、正常に復帰処理が終了したかどうかを調べ、正常に終了していれば、ステップＳ１１０へ進み、このまま装置が停止した直前の状態から装置の動作を再開させる。また、ステップＳ１０６またはステップＳ１０８で正常に終了しなかったと判定したときは、ステップＳ１０９において、エラーの箇所をオペレータに分るようにエラー表示し、回復または復帰処理を中止する。

【００１８】一方、ステップＳ１０２において送信された、非常事態が発生したことによる装置停止に関するシグナルを、図７に示すように、ステップＳ２００において信号送受信部３４０が受信すると、この情報はステップＳ２０５が施されるまで保存される。この情報が送られて来てないときはステップＳ２０５の処理は施されない。このステップＳ２００の受信が行われると、ステップＳ２０１において、現在の装置の位置検出を、位置計測部３２０を用いて行う。続いてステップＳ２０２において、ステップＳ２０１の計測結果をもとにして、位置変動の計算を、位置変動計算部３３０を用いて行う。次に、ステップＳ２０３において、ステップＳ２０２で算出された位置変動計算結果を、信号送受信部３４０を用いて判定する。ここで、装置の急激な位置変動が続いているために、非常事態から回復していない（ＮＧ）と判定したときは、そのままステップＳ２００に戻り、ステップＳ２００～Ｓ２０２の処理を繰り返す。

【００１９】ステップＳ２０３において、装置の急激な位置変動が収まり、非常事態から回復した（ＧＯＯＤ）と判定したときはステップＳ２０４へ進み、現在、装置が停止中かどうかを調べる。これは図６のステップＳ１０２において停止中を表すシグナルが送信され、ステップＳ２００で保存されたか否かで判断し、もしこのシグナルを受信し保存してあれば、ステップＳ２０５へ進み、非常事態回復シグナルをメイン処理部３１０に送信

する。このとき、保存してある停止中を表すシグナルの受信情報はクリアされる。また、ステップＳ２０３において、停止中を表すシグナルを受信していないと判定された場合は、装置は正常のままであるので、ステップＳ２０５での非常事態回復シグナルの送信は行わずにステップＳ２００に戻る。

【００２０】以下に、この処理のより具体的な例として、露光中に地震が発生したことによって急激な位置変動が発生して装置が停止した場合について説明する。地震の発生により急激な位置変動が起きて装置が停止したとき、メイン処理部３１０はまずステップＳ１０１において、地震が発生したときの装置の状態を取得し、図５の形式で保存する。この例では露光中に地震が発生したので、図５に示すようにシーケンス欄に１（露光中）が入る。また、このときのウエハステージの位置（この例では［ｘ，ｙ］＝［＋４０，－６０］）、ウエハの枚数（この例ではウエハカセットが２つあるとして第１のカセットに２５枚、第２のカセットに０枚存在（この例ではカセットがセットされていないことを表すことにする））、現在、オンライン処理を行っているか（この例では行っている状態）の情報がそれぞれ格納されている。その後、ステップＳ１０２において、センサ側（信号送受信部３４０）に停止中を表すシグナルを送信し、ステップＳ１０３において、停止中の状態になり、センサ側から非常事態回復シグナルが送られてくるまで、すなわち、ステップＳ１０４において回復シグナルの受信を行うまで、ステップＳ１０３とステップＳ１０４のループに入る。

【００２１】センサ側では、ステップＳ２００において装置から装置停止中を表すシグナルを受け取り、ステップＳ２０１で装置の位置検出を行い、ステップＳ２０２でステップＳ２０１の結果から位置変動の計算を行う。その後、ステップＳ２０３においてステップＳ２０２での計算結果から、装置の位置変動が続いているか静止したかどうかの判定を行い、まだ位置変動が続いているのであれば、ＮＧと判定してステップＳ２００に戻り、ステップＳ２０１およびＳ２０２の処理を繰り返す。位置変動が収まっていれば、ステップＳ２０３でＧＯＯＤと判定し、ステップＳ２０４へ進む。ステップＳ２０４では、ステップＳ２００で停止中を表すシグナルを受信しているので、ここでＹＥＳと判定し、ステップＳ２０５で、装置に非常事態回復シグナルを送信する。

【００２２】これに応じて装置側では、ステップＳ１０４で非常事態回復シグナルを受信し、ステップＳ１０５において、図４および図５で示される回復処理手段テーブル３６０および非常発生時装置状態格納テーブル３８０を参照して装置の回復処理を施す。このとき、まず図５のシーケンスのＩＤを見ると、１（露光中）になっているので、図４の「露光中：１」の項目を参照する。まず、ウエハステージ（Ｗ．Ｓｔａｇｅ：Ａ）に関しては、○になっているので、ウエハステージが正常に動くかどうかの処理を行う。ウエハカセット（Ｗ．Ｃａｓｓｅｔｔｅ１：Ｂ、Ｗ．Ｃａｓｓｅｔｔｅ２：Ｃ）に関しては、△になっているので、必要時に処理することを表し、さらに図５の同じ項目を参照すると、Ｂの方（第１のウエハカセット）にはウエハカセットが存在しており、Ｃの方（第２のウエハカセット）にはウエハカセットが存在していない（上述のように０はカセットがセットされていないことを表す）ので、ウエハカセットに関してはＢの方についてのみ、正常にセットされているかどうかの処理を行う。またオンラインシステム（ＯｎｌｉｎｅＳ．：Ｚ）に関しては、×になっているので、直接回復処理を行わない。

【００２３】次に、ステップＳ１０６において、以上の回復処理が正常に終了したか否かを判断し、もし正常に終了していればステップＳ１０７へ進み、非常事態発生時の状態への復帰処理に移る。すなわち、図４、図５のテーブルから、ウエハステージに関しては、［ｘ，ｙ］＝［＋４０，－６０］の位置に移動させる。また、Ｂのウエハカセットにウエハが２５枚存在（現在ウエハステージに載っているウエハも含む）しているかどうか調べる。さらにオンラインシステムに関して、正常に再開できるように再起動し、ホストコンピュータへの通信処理などを施す。

【００２４】次に、ステップＳ１０８において、以上の復帰処理が正常に終了したか否かを判断し、もし正常終了していればステップＳ１１０へ進んで装置の処理を再開し、本発明に従った一連の動作を終了する。また、ステップＳ１０６とステップＳ１０８において異常終了したと判定したときは、エラーの表示（異常終了の原因となった項目を含む）を行い、再開処理を行わずに終了する。エラー表示としては、例えば、ウエハがウエハカセットから落下したなど、停止時のときより２枚少なくなっていた場合、「ウエハが停止時より２枚不足しているため再開できません」というメッセージを表示することができる。

【００２５】なお、本発明は上述の実施例に限定されることなく適宜変形して実施することができる。例えば、図３における３２０、３３０、３４０の各部分は、アクティブダンパ、またはそれに類似した装置に取り付けられているが、半導体製造装置にアクティブダンパが装備されていないなどの場合においては、半導体製造装置が据え付けられている床に取り付けるようにしてもよい。また、上述においては、回復処理および復帰処理を別々に行うようにしているが、これらの処理を同時に行うようにしてもよい。またその場合、上述においては回復処理および復帰処理を別々に行ったために図４のテーブルにおいて１つの項目に回復処理用、復帰処理用の２つの値が存在していたが、これを、回復、復帰処理を同時に行うことにより、１つの項目に値を１つにまとめるよう

にしてもよい。また、上述においては、非常事態発生例として地震による装置の急激な位置変動の場合を取り上げたが、同じような急激な位置変動として、装置に何かが衝突した場合においても本発明を適用することができる。さらに、その他、停電などによる急激な電圧の低下によって装置が停止した場合においても適用することができ、その場合は検出装置として電圧計（電流計）を使用すればよい。

【００２６】次に、上述した半導体製造装置を利用することができるデバイス製造例について説明する。図８は微小デバイス（ＩＣやＬＳＩ等の半導体チップ、液晶パネル、ＣＣＤ、薄膜磁気ヘッド、マイクロマシン等）の製造のフローを示す。ステップ１（回路設計）ではデバイスのパターン設計を行う。ステップ２（マスク製作）では設計したパターンを形成したマスクを製作する。一方、ステップ３（ウエハ製造）ではシリコンやガラス等の材料を用いてウエハを製造する。ステップ４（ウエハプロセス）は前工程と呼ばれ、上記用意したマスクとウエハを用いて、リソグラフィ技術によってウエハ上に実際の回路を形成する。次のステップ５（組み立て）は後工程と呼ばれ、ステップ４によって作製されたウエハを用いて半導体チップ化する工程であり、アッセンブリ工程（ダイシング、ボンディング）、パッケージング工程（チップ封入）等の工程を含む。ステップ６（検査）ではステップ５で作製された半導体デバイスの動作確認テスト、耐久性テスト等の検査を行う。こうした工程を経て半導体デバイスが完成し、これが出荷（ステップ７）される。

【００２７】図９は上記ウエハプロセスの詳細なフローを示す。ステップ１１（酸化）ではウエハの表面を酸化させる。ステップ１２（ＣＶＤ）ではウエハ表面に絶縁膜を形成する。ステップ１３（電極形成）ではウエハ上に電極を蒸着によって形成する。ステップ１４（イオン打込み）ではウエハにイオンを打ち込む。ステップ１５（レジスト処理）ではウエハにレジストを塗布する。ステップ１６（露光）では上記説明した露光装置または露光方法によってマスクの回路パターンをウエハの複数のショット領域に並べて焼付露光する。ステップ１７（現像）では露光したウエハを現像する。ステップ１８（エッチング）では現像したレジスト像以外の部分を削り取る。ステップ１９（レジスト剥離）ではエッチングが済んで不要となったレジストを取り除く。これらのステップを繰り返し行うことによって、ウエハ上に多重に回路パターンが形成される。

【００２８】これによれば、従来は製造が難しかった大型のデバイスを低コストで製造することができる。

【００２９】

【発明の効果】以上説明したように本発明によれば、非常事態発生による装置の停止からの回復・復帰までの時間を短縮し、より効率的なデバイス製造を行うことができる。すなわち、非常事態発生のために装置が異常停止した時にそのときの装置状態を保存し、非常事態が終了したときに、回復処理および復帰処理の自動メンテナンス作業を行うため、この作業が正常に終了したときは、そのまま非常事態発生前の処理を続行することができる。また、メンテナンス作業においてエラーが発生しても、故障箇所を表示することができるので、その箇所に関するユニット交換をスムーズに行うことができ、またその他の箇所についても、それぞれの状況に応じたメンテナンス作業を行うことができる。したがって、効率的に修復作業が行え、これが生産枚数の低下を防ぐ効果もある。

【図面の簡単な説明】

【図１】　本発明の一実施例に係る半導体製造装置の外観を示す斜視図である。

【図２】　図１の装置の内部構造を示す図である。

【図３】　図１の装置における非常事態発生時の処理に係る部分の構成を示すブロック図である。

【図４】　図３の構成における回復処理手段テーブルを示す図である。

【図５】　図３の構成における非常事態発生による装置停止時と最新の装置状態テーブルを示す図である。

【図６】　図３の構成における装置側の処理を示すフローチャートである。

【図７】　図３の構成における位置変動センサ側の処理を示すフローチャートである。

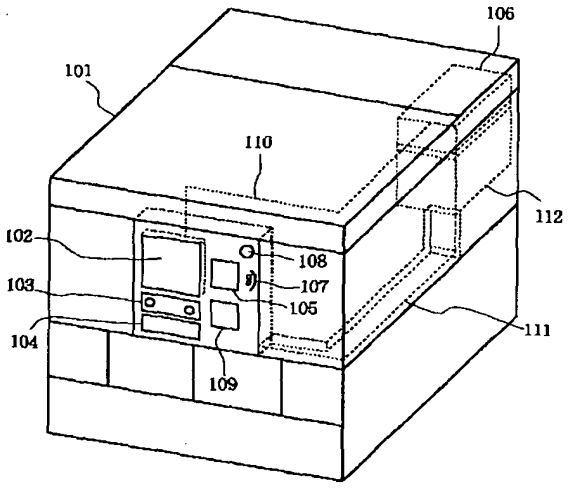
【図８】　本発明の装置または方法を用いることができるデバイス製造例を示すフローチャートである。

【図９】　図８におけるウエハプロセスの詳細なフローを示すフローチャートである。

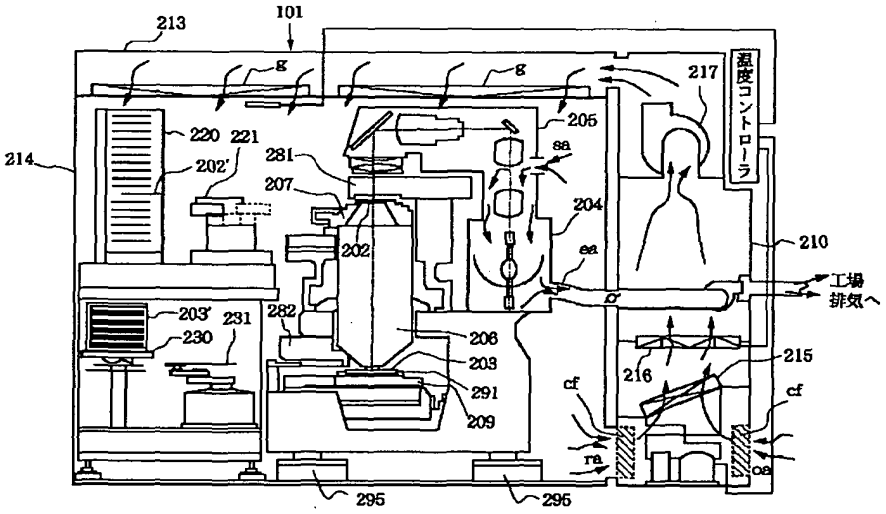
【符号の説明】

１０１：温調チャンバ、１０２：ＥＷＳ用ディスプレイ装置、１０３：操作パネル、１０４：ＥＷＳ用キーボード、１０５：モニタＴＶ、１０６：ＥＷＳ本体、１０７：ＯＮ－ＯＦＦスイッチ、１０８：非常停止スイッチ、１０９：各種スイッチ、マウス等、１１０：ＬＡＮ通信ケーブル、１１１：排気ダクト、１１２：排気装置、２０２：レチクル、２０３：ウエハ、２０４：光源装置、２０５：照明光学系、２０６：投影レンズ、２０７：レチクルステージ、２０９：ウエハステージ、２１０：空調機室、２１３：フィルタボックス、２１４：ブース、２１７：送風機、２８１：レチクル顕微鏡、２８２：オフアクシス顕微鏡、２９５：ダンパ、３１０：メイン処理部、３２０：装置位置計測部、３３０：装置位置変動計算部、３４０：信号送受信部、３５０：回復処理決定部、３６０：回復処理手段テーブル、３７０：ユニット部、３８０：非常発生時装置状態格納テーブル、３９０：装置状態格納テーブル、ｇ：エアフィルタ、ｃｆ：化学吸着フィルタ、ｏａ：外気導入口、ｒａ：リターン口。

【図１】



【図２】



【図４】

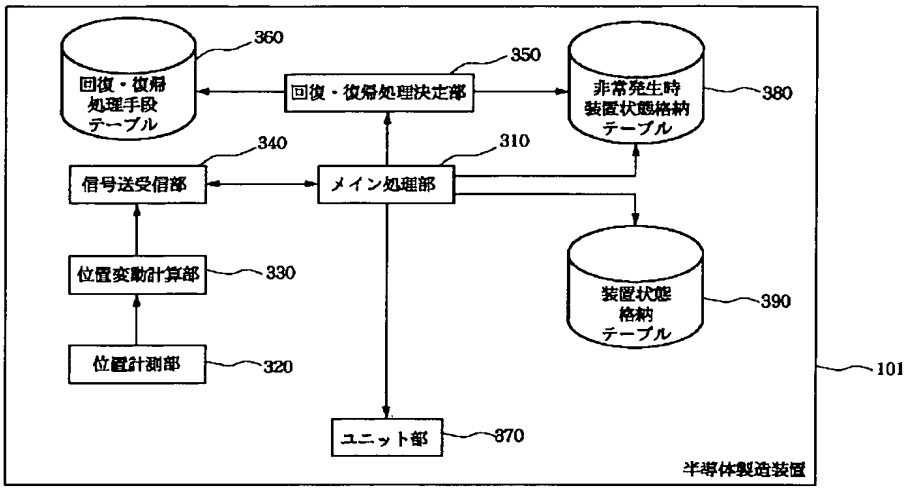
(1) \ (2)	W.Stage : A	W.Cassette1 : B	W.Cassette2 : C	...	Online S. : Z
露光中 : 1	○ : X1,Y1	△ : N11	-△ : N21		× : Flag1
待機 : 2	○ : X2,Y2	△ : N12	△ : N22		× : Flag2
:					
精度計測 : N	○ : Xn,Yn	△ : N1n	△ : N2n		× : Flagn

(1) : シーケンス : ID

(2) : ユニット : ID

W : Wafer,S. : System

【図３】



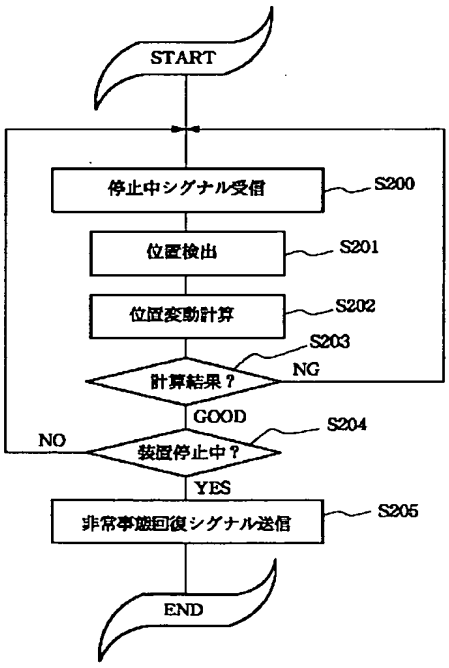
【図５】

(1)＼(2)	A	B	C	…	Z
1	＋40,－60	25	0		○

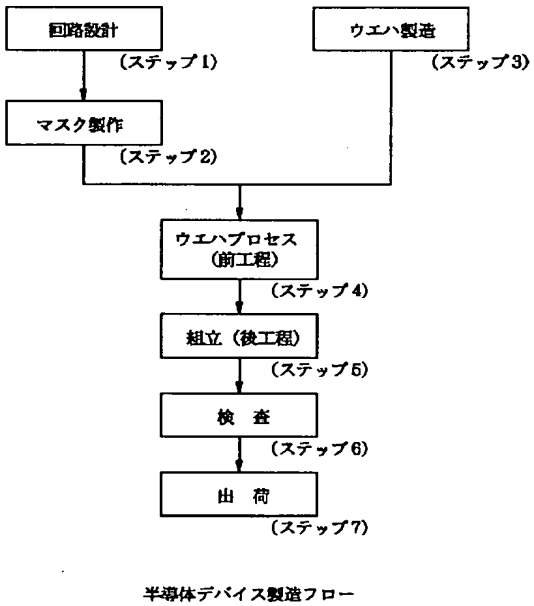
(1)：シーケンス：ID

(2)：ユニット：ID

【図７】

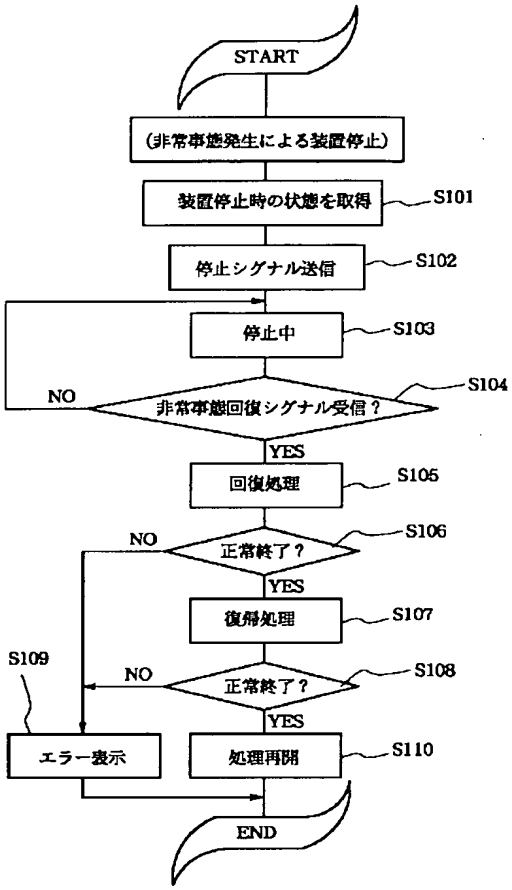


【図８】

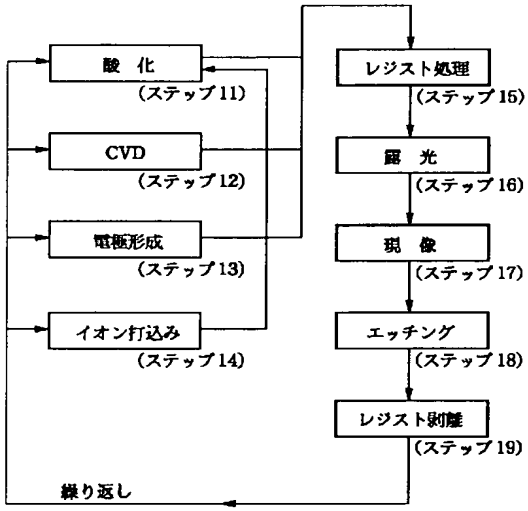


半導体デバイス製造フロー

【図６】



【図９】



ウエハプロセス